

CAREER GUIDE FOR HEATING AND AIR CONDITIONING (HVAC) MECHANICS AND INSTALLERS

Standard Occupational Code: 49-9021.00

Pay Band(s): 3 and 4 ([Salary Structure](#))

Standard Occupational Description: Install, service, and repair heating and air conditioning systems in residences and commercial establishments.

HVAC Mechanic and Installer positions in the Commonwealth are assigned to the following Role(s) in the [Building Trades Career Group](#):

[Trades Technician III](#)

[Trades Technician IV](#)

While HVAC Mechanics and Installers within the Commonwealth are all located within the Building and Trades Career Group, individuals may want to pursue other staff or managerial opportunities within the Commonwealth depending upon individual training, education, knowledge, skills, abilities, and interests.

Other Career Group(s) that may be of interest are:

[Utility Plant Operations](#)

SKILLS, KNOWLEDGE, ABILITIES AND TASKS

(Technical and Functional Expertise)

Skills

Note: *The technical and functional skills listed below are based on general occupational qualifications for HVAC Mechanics and Installers commonly recognized by most employers. Typically, you will not be required to have all of the skills listed to be a successful performer. Recruitment and selection standards for an individual state job must be based on the specific knowledge, skills, and abilities for that job as indicated in the job announcement and job description in the Employee Work Profile.*

1. Installing equipment, machines, wiring, or programs to meet specifications.
2. Determining causes of operating errors and deciding what to do about it.
3. Repairing machines or systems using the needed tools.
4. Determining the kind of tools and equipment needed to do a job.
5. Performing routine maintenance on equipment and determining when and what kind of maintenance is needed.
6. Conducting tests and inspections of products, services, or processes to evaluate quality or performance.
7. Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
8. Understanding written sentences and paragraphs in work related documents.
9. Generating or adapting equipment and technology to serve user needs.
10. Watching gauges, dials, or other indicators to make sure a machine is working properly.

Knowledge

Note: The technical and functional knowledge statements listed below are based on general occupational qualifications for HVAC Mechanics and Installers commonly recognized by most employers. Typically, you will not be required to have all of the knowledge listed to be a successful performer. Recruitment and selection standards for an individual state job must be based on the specific knowledge, skills, and abilities for that job as indicated in the job announcement and job description in the Employee Work Profile.

The Knowledge of:

1. Machines and tools, including their designs, uses, benefits, repair, and maintenance.
2. Design techniques, principles, tools and instruments involved in the production and use of precision technical plans, blueprints, drawings, and models.
3. Materials, methods, and the tools involved in the construction or repair of houses, buildings, or other structures such as highways and roads.
4. Practical application of engineering and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.

Abilities

Note: The technical and functional abilities listed below are based on general occupational qualifications for HVAC Mechanics and Installers commonly recognized by most employers. Typically, you will not be required to have all of the abilities listed to be a successful performer. Recruitment and selection standards for an individual state job must be based on the specific knowledge, skills, and abilities for that job as indicated in the job announcement and job description in the Employee Work Profile.

The Ability to:

1. Apply general rules to specific problems to come up with logical answers. It involves deciding if an answer makes sense.
2. Read and understand information and ideas presented in writing.
3. Keep the hand and arm steady while making an arm movement or while holding the arm and hand in one position.
4. Quickly make coordinated movements of one hand, a hand together with its arm, or two hands to grasp, manipulate, or assemble objects.
5. Tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.
6. Quickly and repeatedly make precise adjustments in moving the controls of a machine or vehicle to exact positions.
7. Correctly follow a given rule or set of rules in order to arrange things or actions in a certain order. The things or actions can include numbers, letters, words, pictures, procedures, sentences, and mathematical or logical operations.
8. Make precisely coordinated movements of the fingers of one or both hands to grasp, manipulate, or assemble very small objects.

Tasks

Note: The following is a list of sample tasks typically performed by HVAC Mechanics and Installers. Employees in this occupation will not necessarily perform all of the tasks listed.

1. Installs, connects, and adjusts thermostats, humidistats, and timers, using hand tools.
2. Repairs or replaces defective equipment, components, or wiring.
3. Joins pipes or tubing to equipment and to fuel, water, or refrigerant source, to form complete circuit.
4. Fabricates, assembles, and installs duct work and chassis parts, using portable metal-working tools and welding equipment.
5. Tests electrical circuits and components for continuity, using electrical test equipment.

6. Disassembles system and cleans and oils parts.
7. Assembles, positions, and mounts heating or cooling equipment, following blueprints.
8. Tests pipe or tubing joints and connections for leaks, using pressure gauge or soap-and-water solution.
9. Installs auxiliary components to heating-cooling equipment, such as expansion and discharge valves, air ducts, pipes, blowers, dampers, flues and stokers, following blueprints.
10. Adjusts system controls to setting recommended by manufacturer to balance system, using hand tools.
11. Inspects and tests system to verify system compliance with plans and specifications and to detect malfunctions.
12. Discusses heating-cooling system malfunctions with users to isolate problems or to verify malfunctions have been corrected.
13. Inspects inoperative equipment to locate source of trouble.
14. Studies blueprints to determine configuration of heating or cooling equipment components.
15. Wraps pipes in insulation and secures it in place with cement or wire bands.
16. Lays out and connects electrical wiring between controls and equipment according to wiring diagram, using electrician's hand tools.
17. Reassembles equipment and starts unit to test operation.
18. Measures, cuts, threads, and bends pipe or tubing, using pipefitter's tools.
19. Cuts and drills holes in floors, walls, and roof to install equipment, using power saws and drills.

INTERESTED?

Like people, occupations have traits or characteristics. These characteristics give important clues about the nature of the work and work environment, and give you an opportunity to match your own personal interests to a specific occupation. When you choose a job in an occupation that matches your own interests you have taken an important step in planning a successful and rewarding career.

HVAC Mechanics and Installers are “Realistic Occupations” because they involve work activities that include practical, hands-on problems and solutions. Realistic occupations deal with real-world materials like metals, tools, and machinery. Jobs in realistic occupations often require working outside and do not involve a lot of paperwork or working closely with others.

LICENSURE, REGISTRATION, OR CERTIFICATION REQUIREMENTS

EPA Mandatory Technician Certification (Universal) You should consider the advantages of certification and include this step in your self-development plan.

Licensing information can be found on the Department of Professional & Occupational Regulations' web site at http://www.state.va.us/dpor/conNEW_reg.pdf

EDUCATIONAL, TRAINING, AND LEARNING OPPORTUNITIES

Skilled trades occupations usually require a high school diploma and may require some vocational training or job-related course work. HVAC Mechanics and Installers usually

complete an instructional program that prepares individuals to apply technical knowledge and skills to form, shape, bend and fold extruded metals, including the creation of new products, using hand tools and machines such as cornice brakes, forming rolls, and squaring shears.

Sources of educational, training, and learning opportunities include:

1. High School diploma or equivalent
2. Training or course work in HVAC
3. Progressively responsible experience in HVAC maintenance and repair
4. US military service
5. On-the-Job Training via summer jobs, etc.
6. Graduation from one of the Commonwealth's technical high schools (check with your local school district for technical high school information)
7. Virginia Community College System – [VCCS Web Sites](#)
8. Talk to your favorite supervisor or a supervisor whom you believe “has it all together”.
9. An instructional program that prepares individuals to apply technical knowledge and skills to repair, install, service and maintain the operating condition of heating, air conditioning, and refrigeration systems. Includes instruction in diagnostic techniques, the use of testing equipment, and the principles of mechanics, electricity, and electronics as they relate to the repair of heating, air conditioning and refrigeration systems.
10. Trades organizations

Apprenticeship generally is considered to be the best way to learn this trade. In Virginia, apprenticeship programs are administered by the Apprenticeship Division of the Virginia Department of Labor and Industry (DOLI). Apprenticeship programs usually consist of 4 or 5 years of on-the-job training and a minimum of 144 hours per year of classroom instruction. Apprenticeship programs provide comprehensive instruction in both sheet metal fabrication and installation. Detailed information on Apprenticeship programs is available on the DOLI web site at <http://www.doli.state.va.us>

COMMONWEALTH COMPETENCIES

Competencies are a set of identified behaviors, knowledge, skills, and abilities that directly and positively impact the success of employees and the organization. Competencies can be observed and measured. When consistently demonstrated, competencies make employees particularly effective in their work. Competencies help lay out a road map to career success. You can use the Commonwealth Competencies to help improve your individual performance by adopting behaviors that make high performing employees successful in their jobs. In this way, you can use the Commonwealth Competencies for your further professional development.

The Commonwealth Competencies are:

1. Technical and Functional Expertise
2. Understanding the Business
3. Achieving Results
4. Serving the Customer
5. Teamwork
6. Interpersonal and Communication Skills
7. Leadership and Personal Effectiveness

The above competencies may be applied to employees throughout the Commonwealth of Virginia. They can be rank-ordered by agencies and hiring managers to represent the needs of a specific job. The rank ordering will change depending upon the occupation, an organization's priorities, the actual job requirements, and the supervisor's preferences.

Career success is both about what you do (applying your technical knowledge, skills, and ability) and how you do it (the consistent behaviors you demonstrate and choose to use) while interacting and communicating with others. Hopefully, by studying the Commonwealth competencies, identifying your developmental opportunities, and working to refine your own competence, you can take charge of your career!

For additional information about the **Commonwealth Competencies** go to: http://jobs.state.va.us/cc_planningctr.htm. For the competencies, we first list the competencies and then define each. Finally, we list competency indicators; to describe what successful performance looks like.

COMMONWEALTH CAREER PATH

Career opportunities in the Commonwealth are not limited to moving “up” to the next highest role and pay band, changing positions, or to becoming a supervisor. That’s because most roles describe a broad group of occupationally related positions that perform a range of work that requires increased knowledge and skills. For that reason, Commonwealth roles describe the career paths within the same or higher-level role for the same or different Career Group. The broad salary range and the Commonwealth’s pay practices provide flexibility in recognizing career development and advancement. ([Salary Structure](#))

For example:

Pay Band	Role		Pay Band	Role
3	Trades Technician III	→	3	Trades Technician III
	↓			
4	Trades Technician IV	→	4	Trades Technician IV
	↓			
5	Trades Manager I	→	5	Trades Manager I
	↓			
6	Trades Manager II	→	6	Trades Manager II

Many employers, including the Commonwealth, expect trades professionals to gain knowledge, skills, and abilities in more than one area. Multi-skilled workers can add value to the organization and often find that a variety of work assignments can be rewarding.

Sample Career Path

Trades Tech III

The Trades Technician III role provides career tracks for trade technicians performing a skilled trade in a specialty area whose work ranges from journey level technician to lead. Some employees may supervise a small crew/staff.

Trades Tech IV

The Trades Technician IV role provides career tracks for the trades technicians whose responsibilities range from the expert technicians to first line supervisors of trades technicians in one or more specialty areas. The expert trades technician provides guidance to other technicians or works on a "multi-trade" team requiring specialized skills and knowledge in several trades areas.

Trades Manager I

The Trades Manager I role provides career tracks for managers who responsibilities range from assisting in the planning and direction of a buildings and grounds program to managing a comprehensive building and grounds program for facilities such as a training center, rehabilitation center, or hospital. Areas managed may include a power plant, buildings and mechanical maintenance, ground maintenance, housekeeping and related services.

Trades Manager II

The Trades Manager II role provides career tracks for managers who plan and direct a buildings and grounds program at a state agency or institution having multiple facilities characterized by a large total resident and staff population engaged in highly diversified and decentralized activities.

ADDITIONAL OCCUPATIONAL INFORMATION CAN BE FOUND AT:

O*NET

http://online.onetcenter.org/cgi-bin/gen_search_page?1

Virginia Employment Commission

<http://www.alex.vec.state.va.us/>

Department of Professional & Occupation Regulation

http://www.state.va.us/dpor/conNEW_reg.pdf

Career One Stop

<http://www.careeronestop.org/>

Virginia Career Resource Network

<http://www.vacrn.net/>